MISCELLANEOUS NOTES

1. A NOTE ON THE OBSERVATION OF A PALM SQUIRREL IN THEKKADY, PERIYAR TIGER RESERVE, SOUTHERN INDIA

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I have regularly seen Jungle Striped Squirrels *Funambulus tristriatus* in semi-evergreen/moist deciduous habitat at Thekkady in the Tourist Zone of the Periyar Tiger Reserve, southern India.

On June 02, 2008, when I was watching a pair of Jungle Striped Squirrels that had descended to the ground in search of food scraps left by tourists, a Palm Squirrel appeared suddenly. It chased off one of the Jungle Striped Squirrels and disappeared as quickly as it had appeared. The Palm Squirrel I saw was probably of the three-striped species, *Funambulus palmarum*, which is found in Tamil Nadu to the east of Periyar Tiger Reserve.

Seeing the two species close together provided an opportunity to appreciate how distinct they are. The Palm Squirrel was much brighter in appearance than the Jungle Striped Squirrel. About the difference between the two squirrels, Wroughton (1905) observed, "*F. tristriatus* is much the darker of the two, the palest specimen I have seen being darker than the darkest *palmarum*; the rufous vertex of the head which is without exception in *tristriatus* is often absent in *palmarum*..."

I have not seen palm squirrels at Thekkady previously. Dr. P.O. Nameer (pers. comm.) writes that my recent observation is interesting and that he has not seen the two squirrels co-existing.

ACKNOWLEDGEMENT

I thank Dr. Nameer for his comments on this note.

REFERENCE

WROUGHTON, R.C. (1905): "The" common striped palm squirrel. *J. Bombay Nat. Hist. Soc. 16(3)*: 406-413.

2. BURROW STRUCTURE OF INDIAN BUSH RAT *GOLUNDA ELLIOTI* AND BROWN SPINY MOUSE *MUS PLATYTHRIX* IN TIRUCHIRAPPALLI DISTRICT, TAMIL NADU

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Rodents occur in virtually every terrestrial environment that supports life (wild, agricultural or urban). Most rodents are inhabitants of burrows. The subterranean mode of living provides the rodents home, protection from predators and also helps in thermoregulation (Prakash *et al.* 1965). Studies on the burrowing habit of rodent pests are required to understand their social organization and behaviour of dominance (Barnett and Prakash 1975; Prakash and Mathur 1987). Further, they also help to distinguish rodents from other burrowing animals, for population estimation, placing poison baits and physical control (Neelanarayanan *et al.* 1996). The nature and internal structure of burrows of field rodents have been reported for *Bandicota bengalensis* (Barnett and Prakash 1975; Sivaprakasam and Durairaj 1995; Neelanarayanan *et al.* 1996), *Mus booduga* (Sivaprakasam and Durairaj 1995; Neelanarayanan *et al.* 1996), *Millardia meltada* (Urs 1968; Sivaprakasam and Durairaj 1995; Neelanarayanan *et al.* 1996), and *Tatera indica* (Chandrahas and Krishnaswamy 1974; Barnett and Prakash 1975; Goyal and Ghosh 1993; Sivaprakasam and Durairaj 1995; Neelanarayanan *et al.* 1996).

There is not much published information available on the nature of burrow patterns of the Indian Bush Rat *Golunda ellioti* and Brown Spiny Mouse *Mus platythrix*.

Therefore, the present study was undertaken to examine the burrow structure with reference to the morphology and anatomy along with its dimensions, of these two species in Tamil Nadu.

Study area

The present study was carried out in Puthanampatti, Vellakkalpatti, Thirupattur and Siruganur villages of Tiruchirappalli district (10° 00'-11° 30' N; 77° 45'-78° 50' E). Most areas where we studied the burrow patterns of *G. ellioti* and *M. platythrix* were dry interspersed with forest and cultivated lands. The Tiruchirappalli district has both fertile and comparatively dry tracts for crop cultivation. The present study was carried out in the dry tracts of Tiruchirappalli district. The terrain of the study area is slightly undulating. The ground water is utilized for irrigating the cultivated crops.

Material and methods

The burrows of *G. ellioti* and *M. platythrix* were searched with the help of local and experienced rodent trappers. The identified burrows were studied visually for their structure and nature of burrow entrance, and noted as suggested by Neelanarayanan *et al.* (1996). The crops nearest to the burrows, diameter of the entrance, horizontal length of the burrow (whether the main and emergency entrances are clearly seen or not), number of main and emergency exits were recorded. Thereafter, the burrows were dug out and their routes, number of blind alleys, number of internal and external soil plugging, number of brood and food chambers and the type of nesting materials were recorded as suggested by Sivaprakasam and Durairaj (1995). The diameter of the brood chamber was also measured and recorded. All measurements were taken using a thread and later calibrated with a measuring tape. Data are given as mean with standard deviation (SD).

Table 1: Morphometric measurements (cm) and other characteristics of burrows of *Golunda ellioti* (*n* = 40)

Parameters	Mean ±S.D.
Main burrow entrance diameter	8.3 ±2.4 (4.5-13.0)
Emergency burrow entrance diameter	5.8 ±1.3 (4.5-8.0)
Vertical depth of the burrow from the ground level	46.8 ±25.3 (11.5 - 98.5)
Horizontal width of burrow	56.4 ±37.1 (20.0-127.0)
Number of burrow openings*	
Main Entrance	1.0 ±0
Emergency openings	1.0 ±0
Number of soil plugging*	
External	NIL
Internal	NIL
Number of blind alleys*	1.2 ±0.4 (1.0-2.0)
Number of food chambers*	NIL
Number of brood chambers*	2
Diameter of the brood chambers	13.2 ±3.4 (6.0-16.5)
Male*	1.0 ±0
Female*	1.0 ±0
Litter*	3.6 ±1.9 (1.0-7.0)

Values in parentheses indicate range
*Values are not measurements

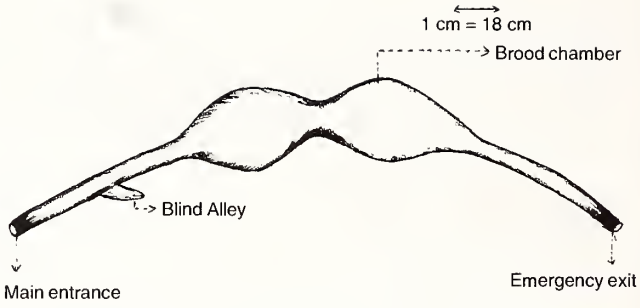

Fig. 1: Burrow structure of *Golunda ellioti*

Results and discussion

The burrows of rodents provide a relatively stable microclimate, suitable breeding site and protection from weather extremes and predators. Burrows and their structure (length, depth and diameter) depend upon the species' biological requirements and soil properties like texture, moisture, aeration and chemical composition (Parshad and Tripathi 2004). According to Parshad and Tripathi (2004), rodents dig elongated, deep, and complex burrows in clay and loamy soils, which persist for longer periods whereas, burrows in sandy soils are less deep and complex because of the limited stability and integrity of their tunnels and chambers.

Burrows of *G. ellioti* were observed in the barren lands to agricultural fields with crops of groundnut (*Arachis hypogea*) and red gram (*Cajanus cajan*). The burrow system of *G. ellioti* was simple and characterized by the absence of heap of soil and its entrance always remained open (Fig. 1). The number of burrow openings per burrow system was two. Similar descriptions have been made for *G. ellioti* by Prater (1971). The main burrow entrance diameter of *G. ellioti* ranged from 4.5 to 13.0 cm with a mean (± S.D) of 8.3 ±2.4 cm. The mean emergency burrow entrance diameter of *G. ellioti* was found to be 5.8 ±1.3 cm (Table 1).

G. ellioti digs its burrow at the ground level. The mean (± SD) vertical depth of burrows of *G. ellioti* was

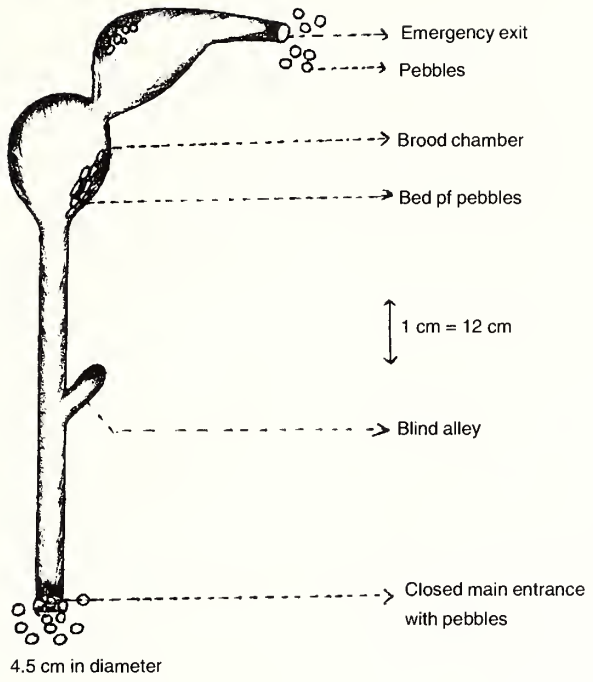

Fig. 2: Burrow structure of *Mus platythrix*

46.8 ±25.3 cm. The mean horizontal length of burrow system was 56.4 ±37.1 cm. There was no external and internal soil plugging in the burrow system of *G. ellioti*. It is generally observed that the mean number of blind alleys in a burrow of *G. ellioti* was 1.2 ±0.4 (Table 1). Food chambers and food hoarding behaviour were not observed in the burrows of *G. ellioti*. Earlier, Barnett and Prakash (1975), and Prakash and Mathur (1987) described the burrows of this species as simple.

Invariably all the burrows (n = 40) excavated had two brood chambers. The mean diameter of the brood chambers was found to be 13.2 ±3.4 cm. The mean number of individuals in a burrow was one male, one female and 3.6 ±1.9 litters for *G. ellioti*. Further, a study on the diet of *G. ellioti* is required to conclude whether this species is a pest of agricultural crops or not.

The Brown Spiny Mouse *Mus platythrix* had a unique pattern of burrow entrance. The burrow entrance of *M. platythrix* had a small to medium quantity of heap of more or less uniform sized pebbles (Fig. 2). Prater (1971), and Soni and Idris (2005) also describe the presence of the heap of pebbles at the burrow entrances of *M. platythrix*. Besides, the burrows of this species were located in the barren lands near to agricultural lands. Parshad and Tripathi (2004) reported the occurrence of *M. platythrix* burrows in sandy and gravel plains. This rodent species closes its burrow entrance after entering. This is in confirmation of earlier descriptions of Prater (1971). The observed behaviour of this rodent pest might be to prevent the entry of predators.

M. platythrix burrows had two openings. To confirm the presence of animals in burrows with closed entrances, the burrow entrances were excavated (n=18) and an occupant (*M. platythrix*, n=18) was present in all of them. Thus, it is inferred that the burrow entrances of the *M. platythrix* are highly species-specific. Further, with the help of this key one can identify the occupant *M. platythrix* under field conditions.

The burrow system of *M. platythrix* was simple. In general, the burrow system of *M. platythrix* had an entrance hole and an emergency opening. The mean (± SD) diameter of main and emergency burrow entrance of *M. platythrix* was 6.9 ±1.4 cm and 5.6 ±0.9 cm, respectively. Mean vertical depth of burrows of *M. platythrix* was 36.9 ±24.1 cm. The mean horizontal length of burrow systems was 76 ±43 cm. The number of external and internal soil pluggings in the burrow system of *M. platythrix* was 1 (n=15) and 2 (n=3) respectively. We observed mean number of blind alleys in a burrow of *M. platythrix* was 1.4 ±0.06. Food chambers and

Table 2: Morphometric measurements (cm) and other characteristics of burrows of *Mus platythrix* (n = 18)

Parameters	Mean ±S.D.
Main burrow entrance diameter	6.9 ±1.4 (5.0-9.5)
Emergency burrow entrance diameter	5.6 ±0.9 (4.0-7.5)
Vertical depth of the burrow from the ground level	36.9 ±24.1 (17.0-92.0)
Horizontal width of burrow	76.0 ±43.0 (22.0-183.5)
Number of burrow openings*	
Main Entrance	1.0 ±0
Emergency openings	1.0 ±0
Number of soil plugging*	
External	1.0 ±0 (n=15)
Internal	2.0 ±0 (n=3)
Number of blind alleys*	1.4 ±0.06 (1.0-3.0)
Number of food chambers*	NIL
Number of Brood chambers*	1.3 ±0.5 (1.0-2.0)
Diameter of the Brood chambers	12.1 ±2.2 (9.5-20.0)
Male*	1.1 ±0.3 (1.0-2.0)
Female*	1.0 ±0
Litter*	3.0 ±2.1 (1.0-6.0)

Values in parentheses indicate range
*Values are not measurements

food hoarding behaviour was not observed in the burrows of *M. platythrix* (Table 2).

Burrows of *M. platythrix* had one to two brood chambers (1.3 ±0.5). The mean diameter of the brood chambers was 12.1 ±2.2 cm. The brood chambers were furnished with a bed of pebbles. The present observation is in accordance with the report of Prater (1971). The mean number of individuals in a burrow was 1.1 ±0.3 (male), 1 ±0 (Female), and 3 ±2.1 (litter).

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3. DISTRIBUTION AND STATUS OF THE WILD WATER BUFFALO *BUBALUS ARNEE* IN BHUTAN

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The Asiatic Wild Water Buffalo *Bubalus arnee* Kerr (*bubalis* Linn.), henceforth Wild Water Buffalo, is a globally threatened species and has been listed as 'Endangered' (IUCN 2007). Once widespread over large parts of South and South-east Asia, this rare bovine is now mainly confined to north-eastern India with small numbers in Nepal and Indo-China (Corbet and Hill 1992; Choudhury 1994). The occurrence in southern Bhutan has been mentioned by Blower (1986), Choudhury (1994) and Wangchuk *et al.* (2004).

I had visited parts of southern Bhutan since October 1985 (not frequently); from September 2004 to June 2007, I made frequent visits as part of my official work as Deputy Commissioner of Baksa district in Assam (having common border with Bhutan). During these visits, I had the opportunity to observe wild buffaloes. In this note, the distribution, habitat and status of the wild water buffalo in Bhutan have been discussed.

Bhutan being mountainous does not have much habitat for the Wild Water Buffalo, which requires grassland with water bodies, preferably on flat terrain. Owing to its occurrence in the Manas National Park in Assam, India (Gee 1964; Choudhury 1994), which is located on the international boundary, there was always chance of animals' crossing over. The observations made so far indicates that there are nine areas in Bhutan where the Wild Water Buffalo is still seen or seen till the recent past. These are: (1) Gabhorukunda (Gobarkanda) (26° 46'-48' N; 90°49-53' E), (it is not a point location but a stretch of grassy area) (2) Mathanguri (Matharguri) (26° 47' N; 90° 58' E), (3) Nunmati (26° 47' N; 90° 59'E), (4) Rabang nullah (26° 49' N; 91° 04' E), (5) East of Doimari (26° 49' N; 91° 06' E), (6) Kukulong (26° 47' N; 90° 45' E), (7) Kalamati (26° 47' N; 90° 40' E), (8) Saralbhanga (26° 52' N; 90° 15' E) and (9) Jamduar (26° 44' N; 89° 52' E).